LX600 LCD TV Technical Information

TC-32LX600

Outline

- Features
- Overall Block Diagram
- A Board Main Layout
- Power On Sequence
- Protection Shutdown
- Troubleshooting
- Adjustments

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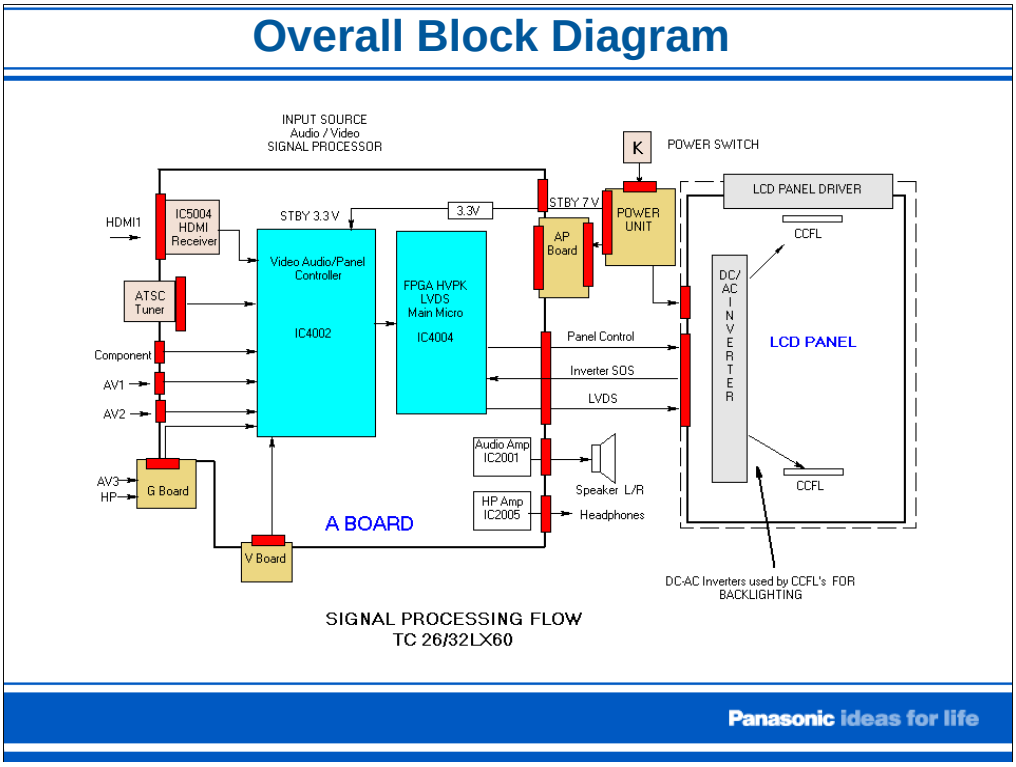
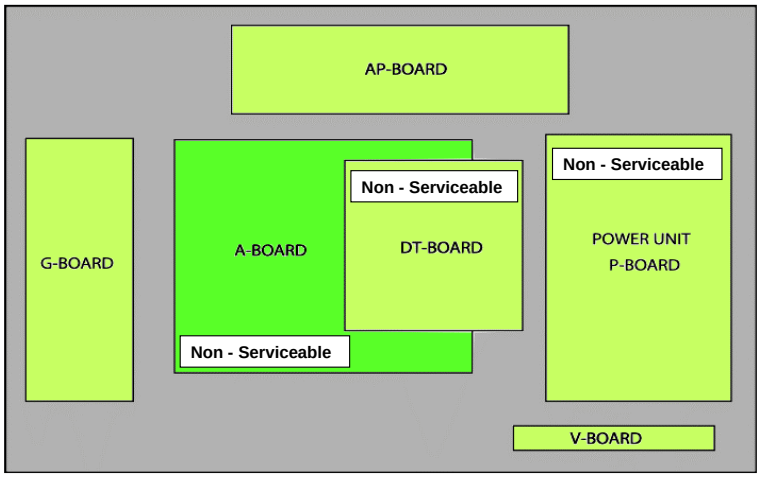
Features

Model	TC-LX60	TC-LX600
Display Capability	480p/720p/1080i	480p/720p/1080i
Aspect Ratio	16:9 (Widescreen)	16:9 (Widescreen)
Aspect Control	Normal, Zoom, Full, and Just	Normal, Zoom, Full, and Just
Resolution (Number of Pixels)	1,049,088 (1366x768) pixels	1,049,088 (1366x768) pixels
Contrast Ratio	Up to 3000:1	Up to 3000:1
Brightness (Panel, cd/m^2)	500	500
Integrated ATSC Tuner	Yes	Yes
HDMI-HDCP Interface	1	2
Composite Video Input	3	3
S-Video Inputs	2	2
Component Video Input	1	1
Monitor Output	1	1
Headphone Jack	Yes	Yes



The TC-26/32LX60 and 600 series LCD Direct View TVs differ from previous models in that all signal processing is accomplished on the A board. The video processing function that had been previously accomplished by the DG board is now performed on the A Board by IC4002. This IC serves as the Main micro and Video /Audio Panel controller. IC4004 is a Field Programmable Gate array that is responsible for the pixel conversion and addressing of the Active Matrix display within the LCD Panel. This IC also contains the low voltage differential signaling (LVDS) transmitter used for the conversion of the 8-bit RGB video into a differential RGB output signal. The LVDS receiver on the LCD panel converts the differential RGB output signal from the A board into an 8-bit RGB signal that is output to the LCD Panel.

Board Layout



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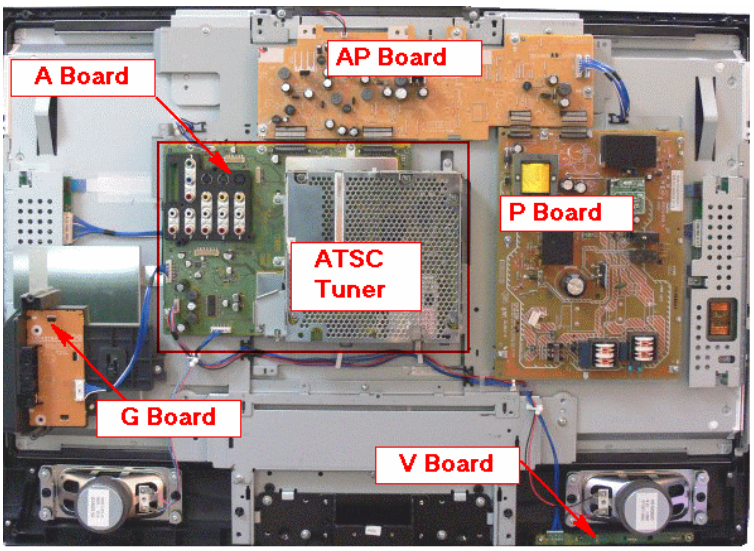
This is the board layout of the TC-LX600 LCD Television. The P board, DT board, and A board are non serviceable. The G board, AP board, and V board are serviceable.

Board Layout Pictorial



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P Board – The Power unit is responsible for generating the Standby 7V, 10V, and 24V, which provides input to some of the regulators on the AP Board. It also generates the switched 24V inverter voltage.

AP Board – Comprised of all secondary voltages which include the Main 9V, SUB5V, Sound 20V, Panel 12V, Standby 3.3V.

A Board – Comprised of all AV inputs and the HDMI interface with the exception of one AV jack which is located on the G board. All audio and video processing is performed on this board.

G Board – Contains an additional AV connector and the Headphone Jack.

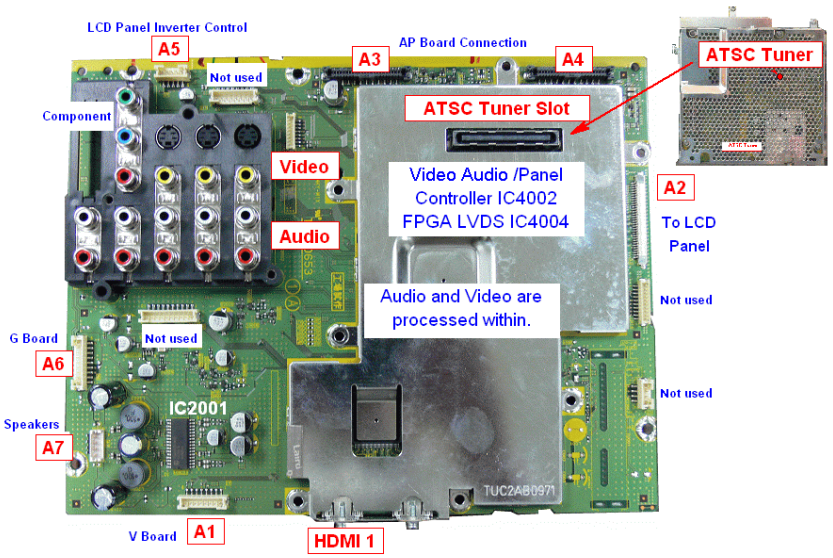
ATSC tuner – The Digital Tuner plugs into a connection on the A board.

V Board - Remote sensor and Power LED.

Board Description

Board Name	TC-26LX600	TC-32LX600	Function
A-Board	TZRXN010MZM	TZRXN010MYM	Main (AV Switch, Audio, MCU, Global Core, AV connector)
AP-Board	TZRXN020MYK		DC-DC Converter
DT-Board	TNPG169S		Digital Tuner
G-Board	TNPA3784S		Front Terminal
V-Board	TNPA3749ACS		Remote Receiver, LED
P-Board	N0AB3GJ00010		AC-DC

A Board Main



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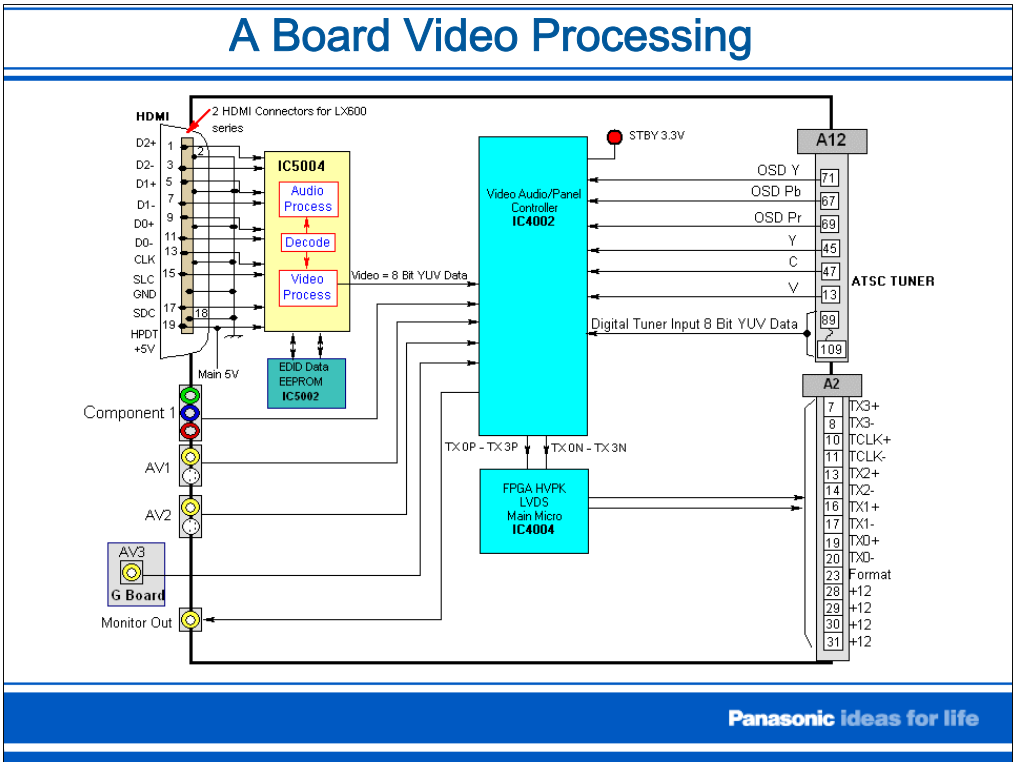
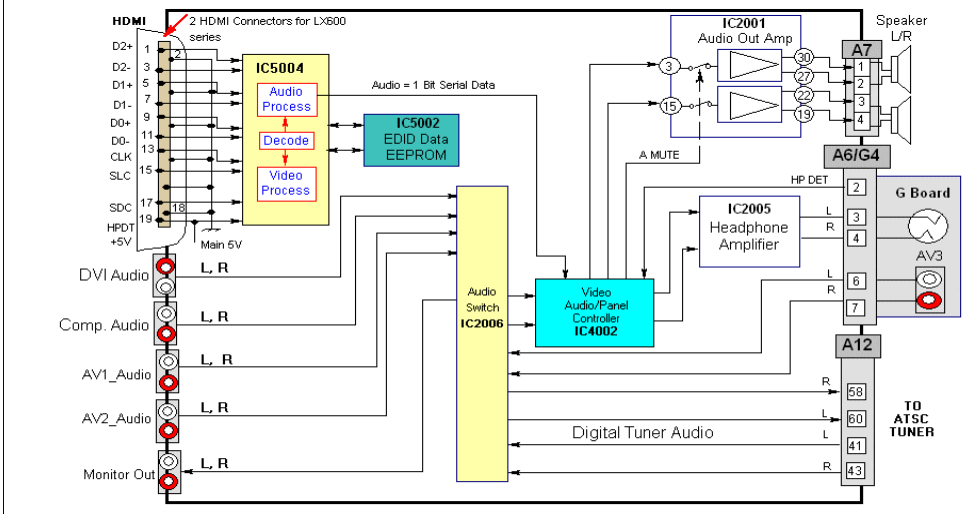
The A board (Main Board) is a self contained board responsible for the input selection, and processing of all Audio and Video input signals. All audio and video connections with the exception of those found on the G board reside on this board. The G board contains an additional AV Jack, headphone jack, and front panel switches. The unit is equipped with a single ATSC tuner which plugs directly onto the A board. The LX60 features a single HDMI interface while the LX600 offers two.

The connectors and pin outs provided in this diagram are, for the most part, the only available access points for board level repair troubleshooting.

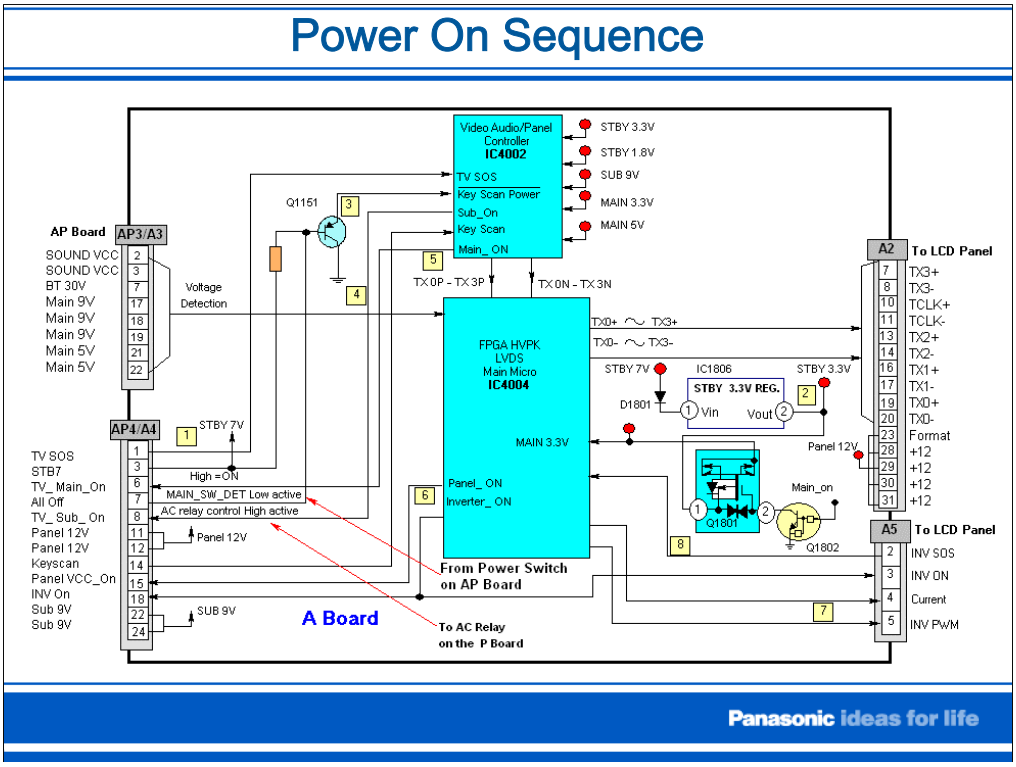


Video processing is performed on the A board. The A board incorporated in these models is now responsible for signal processing, and system control operation. The video processing function that had been performed by the DG board of the previous models is now accomplished on the A Board by IC4002. This IC is also responsible for selectively switching all video inputs (Tuner, Component, Composite, S-Video, and HDMI). The HDMI video is converted to an eight-bit YUV signal by the HDMI IF receiver (IC5004) before being output to the video selector. IC5002 provides the copyright protection for the incoming HDMI signals. The ATSC interface (DT board) processes the ATSC, NTSC, and QAM television signals. The analog NTSC and digital ATSC or QAM signal of the DT board are output to the A board via the connector DT12/A12. IC4002 is responsible for processing all video, which includes image resizing, noise reduction, I/P conversion and Gamma adjustment control. Although selected by a different IC, the audio processing function is also performed by IC4002. OSD is also generated by IC4002 and mixed with the video signal before being output to IC4004. IC4004 is a Field Programmable Gate array responsible for the pixel conversions and addressing of the Active Matrix display within the LCD Panel. This IC also contains the low voltage differential signaling (LVDS) transmitter, used for the conversion of the 8-bit RGB video into a differential RGB output signal. The LVDS receiver on the LCD panel (not shown in the drawing) converts the differential RGB output signal from the A board into an 8-bit RGB signal that is provided to the LCD Panel.

A Board Audio Processing



Audio processing is performed on the A board. Audio signals from the DVI, Component, and the Composite video input enter the Audio Switch IC2006 where the desired input is selected. HDMI Audio is processed and converted into a one bit digital audio format by the HDMI IF receiver, IC5004. The HDMI audio bypasses the audio switch and enters IC4002 for selection and processing. The output of IC2006 is processed within the Video/Audio controller IC4002. The Audio Output from the Video/Audio controller is output to the speakers via the Audio Amplifier IC2001 and pins 1 through 7 of connector A7. The Headphone amplifier is activated when the headphones are plugged into the headphone jack located on the G board. This action mutes the audio to the speakers by disabling the Audio output Amplifier IC2001.



1.The Standby 7V (STB_7V) is generated on the P board (non- serviceable) when AC power is applied. This can be measured on Pin 3 of Connector AP4/A4.

2.The STB_7V is regulated to 3.3 V on the Main board and applied to the Main Video and Audio Controller IC4002.

3.Power on command by the remote control is not possible until the main power switch is activated. When the Main Power Switch (AP Board) is activated, a active low ALL_OFF signal is provided to the base of Q1151 via pin 7 of the connector AP4/A4. As a result Q1151 turns on and a low is applied to the Key Scan Power input pin of IC4002. This causes the unit to turn on, display a raster and become fully operational. The remote control commands are now received and processed by the main unit. To continue having full access via the remote control, the unit must be powered off by the remote control, not by the power switch located on the main unit.

4.The Sub-On signal is issued by IC4002 on pin 8 of connector AP4. This signal is responsible for pulling the contacts on the AC relay on the Power Board.

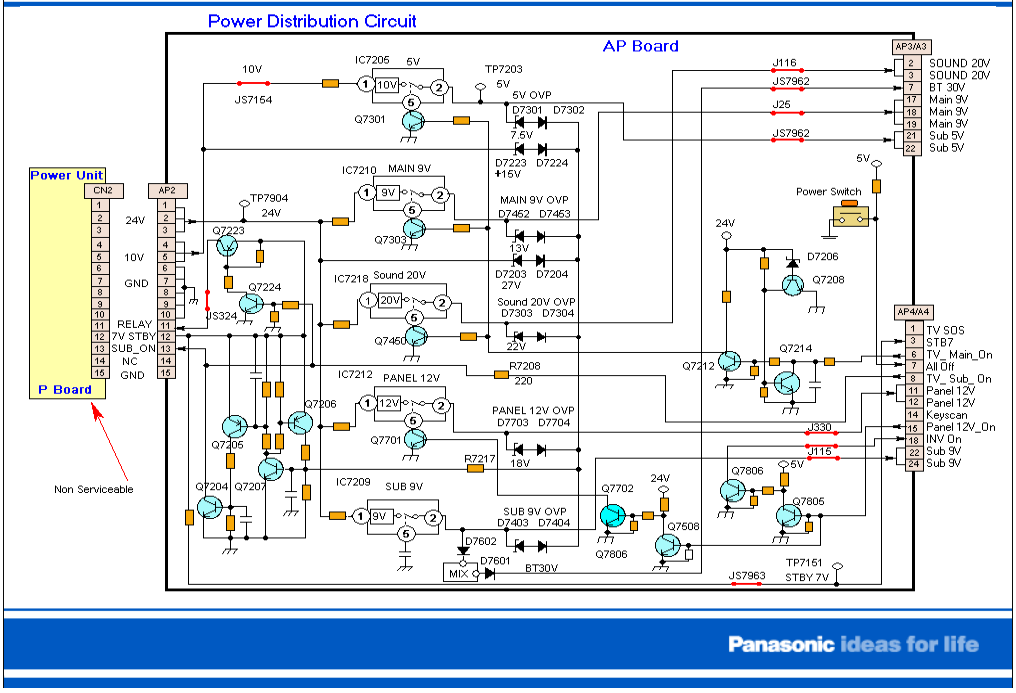
5.The Main_On signal is issued by IC4002 and provided to the AP board via pin 6 of connector AP4/A4. It enables the Main 9V, Main 5V, and the Sound 18V (Not Shown in the diagram) secondary power sources of the AP board. The Main_On signal is also responsible for enabling the Main 3.3V regulator needed to power IC4004.

6.IC4004 provides the Panel_On signal that enables the Panel 12V regulator on the AP board. It also provides the Inverter_On signal that enables the DC to AC inverter circuitry on the LCD Panel.

7.The Inverter PWM signal and Current signal control the output voltage of the DC to AC inverters that is used to power the CCFLTs. Increasing the on time of the INV_PWM signal, which can be seen on pin 5 of connector A5, will increase the brightness of the backlighting on the LCD Panel.

8.The INV_SOS signal is issued by the logic that resides on the LCD Panel if there is a problem with the panel of inverter power supply.

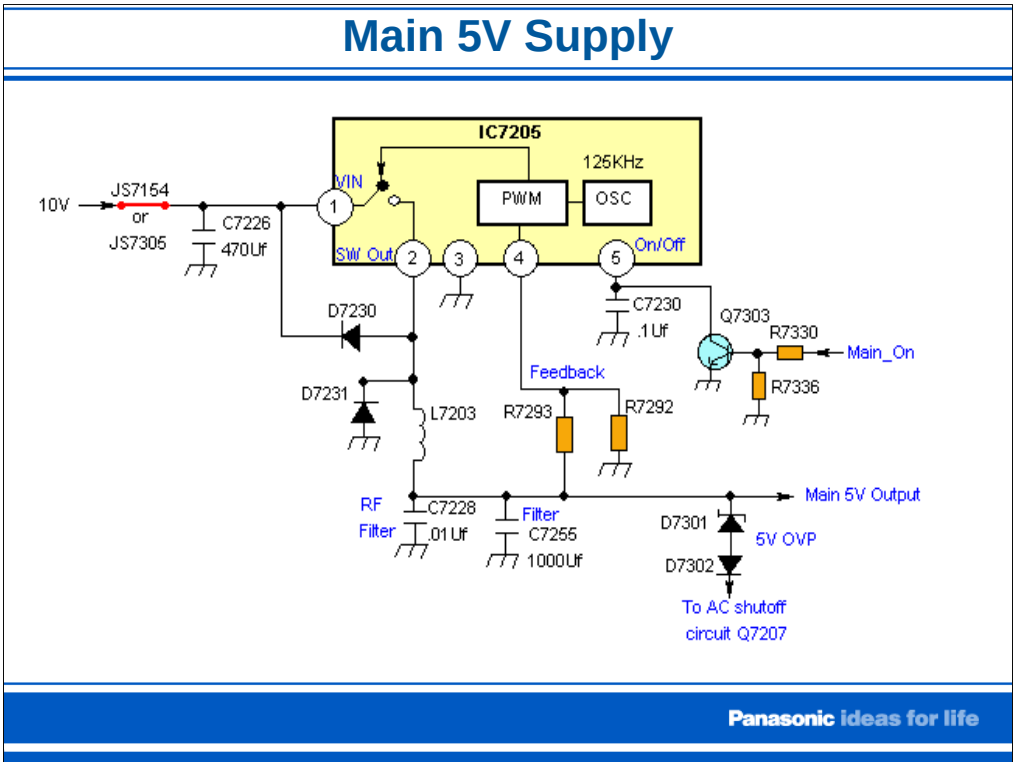
AP Board Power Distribution



The AP Board is responsible for the regulation, distribution and dissemination of all secondary voltages derived from the 24V and 10V source supplies on the P Board. The 7V STBY voltage is present when the unit is plugged into the AC outlet. When the main power switch is activated, it is sensed on the main board by IC4002. A TV_SUB_ON signal is subsequently issued in response, on pin 9 of connector AP4, which activates the “Relay” signal on pin11 of connector AP2. This pulls the contacts on the AC relay on the P board and allows for the output of the 24V and 10V on that same connector. The TV_Main_ON signal issued by IC4002, appears on pin 6 of connector AP4/A4 and provides the output “Enable” for the 5V, 9V, and 20V switched mode power supplies. Q7208 serves as a 24V detection line and provides an enable for the Main_ on signal to function if 24V is detected. The panel 12V_On signal provides the “Enable” for the Panel 12V logic and the enable for the 24V inverters on the LCD Panel.

When a panel-on command is issued to turn on the Panel 12V switched supply IC7212 located on the AP Board, transistor Q7805 turns on causing Q7806 to turn off. As a result, the INV_ON pin of IC4004 on the A board goes high. That same DC is applied to the LCD Panel’s inverter input on pin 3 of connector A5 also on the A board.

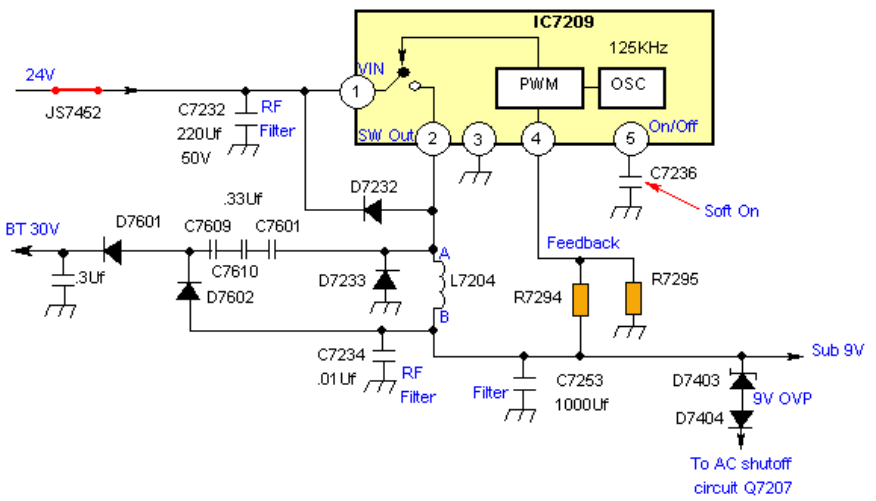
The over voltage protection circuitry affiliated with each of the regulators, is responsible for monitoring for excessive or over voltage conditions, and is designed to turn off the AC power by disabling the SUB_ON signal needed to turn on the AC relay. All voltages are accessible and can be measured either on the connectors or on the highlighted jumper locations.



The Main 5V, Main 9V, Sound 20V, and Panel 12V supplies are very similar in their design and operation. Panasonic utilizes several Buck regulator circuits to generate these voltages. The primary difference is that the input voltage to the Main 5V regulator is 10V whereas the 9V, 20V, and 12V supplies use 24V.

1. Operation begins when the Main_On signal, derived from the TV_Main_On (active low) signal turns off Q7303, providing the “Enable” for operation of IC7205 on pin 5.
2. The 10V input voltage is switched between pins 1 and 2 at a frequency of 125Khz through the use of an internal oscillator and PWM circuit.
3. When the switch is closed, current flows through coil L7203 causing a field buildup.
4. When the switch opens, current generated by the field collapses in L7203 and charges the capacitor C7255; D7231 acts as a ground return.
5. Voltage feedback and regulation is accomplished through the use of a voltage divider, which consists of R7292 and R7293.
6. D7230 prevents peaks generated by L7203 from exceeding 10V and destroying the IC.
7. Zener diode D7301 monitors the Main 5V output for over voltage and goes into conduction if the output voltage becomes excessive. Diode D7302 which is reversed biased during normal operation goes into conduction and trips the AC shutoff circuit.

SUB 9V and 30V Tuner Supply



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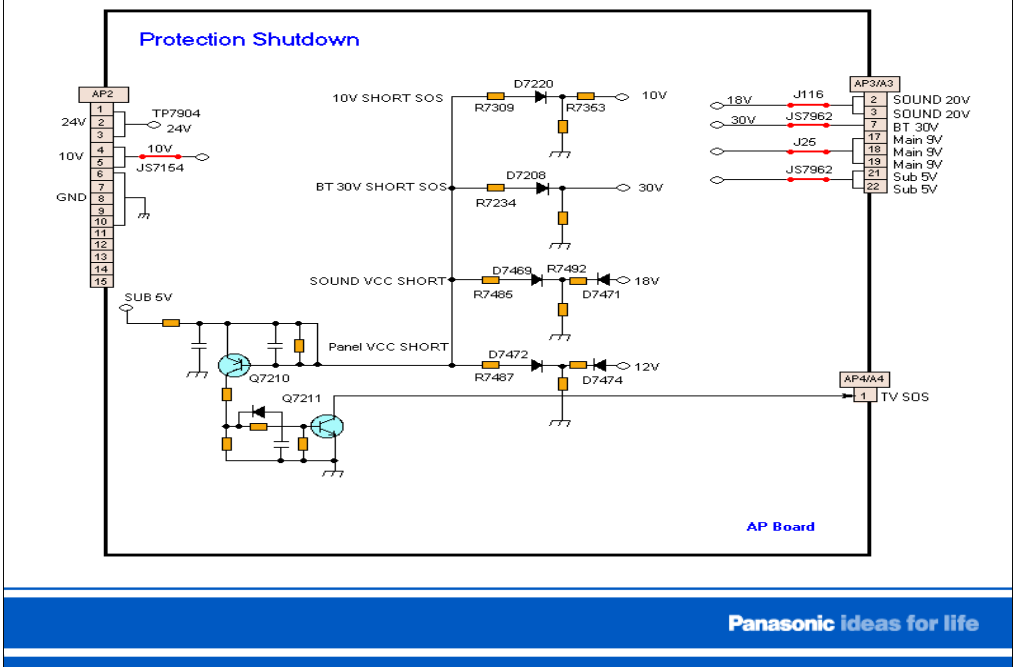
The SUB 9V and BT 30V Tuner sources are generated by the same switch mode power supply IC, IC7209.

The supply encompasses the design of both Buck and Boost regulator circuits.

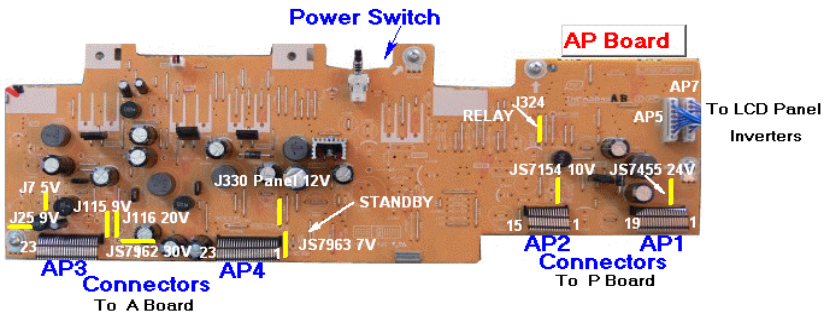
1. A soft-on enable is provided on pin 5 of IC7209 during the initial power on sequence as capacitor C7294 charges.
2. The 24V input is switched between pins one and two at a frequency of 125Khz.
3. The operation of the 9V supply is similar to that of the 5V supply.
4. D7602 is responsible for supplying the 9V to the capacitors when the magnetic field within the coil collapses.
5. When the switch contact is open, the A side of coil L7204 goes negative, providing a reference for the capacitors C7601, C7610, and C7609 to charge to 9V via the diode D7602.
6. The next time the switch is closed, the 24V appears at the A side of the coil causing the same capacitors to charge to 24V. As a result the 24V and 9V charges add up, resulting in the 30V output.

AP Board Protection Shutdown



The protection shutdown circuit is designed to monitor for a short or loss of the 10V, 30V, Sound 18V,and the Panel VCC sources. If any of these voltage sources go low, it will cause Q7210 to conduct. As a result, the collector of Q7211 goes low to signal a shutdown condition to IC4002 on the A board. The TV_SUB_ON pin of IC4002 goes low to de-activate the AC relay on the P board.

AP Board Test Point Locations



Test Points	Voltage
J7	Sub 5V
J116	Sound 20V
J25	Main 9V
J7	Sub 5V
J330	Panel 12V On
J115	Sub 9V
JS7963	STBY 7V
JS7154	10V
JS7962	30V

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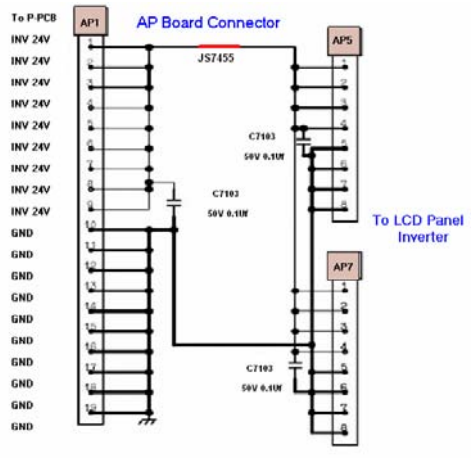
This page shows the test points that can be accessed to troubleshoot the AP board.

AP Board LCD Power Distribution



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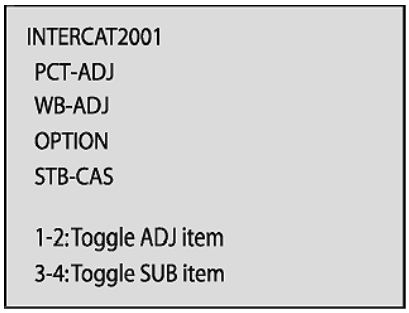
Connector AP1 provides the switched 24V from the power unit to the LCD Panel via connectors AP5 and AP7. The 24V can be monitored on connector AP5 or on jumper JS7455.

Adjustment Procedure

How to enter adjustment mode

While pressing the **VOLUME DOWN** button of the main unit, press the **RECALL** button of the remote control transmitter three times in a row within two seconds.



Adjustment method.....Use the remote control.

1. button...Main items Selection in forward direction
2. button...Main items Selection in reverse direction
3. button...Sub items Selection in forward direction
4. button...Sub items Selection in reverse direction

Cancellation

To exit the adjustment mode, turn the unit off using the power button of the remote control or the main power switch of the main unit.

Adjustment

Main Item	Sub Item	Remarks	Sample Data
PCT-ADJ	COLOR	Video level (RF, video, component)	OFF
	R-Y-A	Video level (RF, video, component)	2E
	R-Y-G	Video level (RF, video, component)	73
	BACK-L	Tint Adjustment	FA
	TINT	Sub Color	DD
WB-ADT	B-CENT	Sub Tint	B7
	G-CENT	Sub Back Light	8D
	R-CENT	Sub Bright	65
	B-GAIN	B-Y Gain	C2
	G-GAIN	R-Y Demodulation axis	E0
	R-GAIN	WHITE 100% (Not ADJ)	FF
OPTION	OPTDD	RED 100% (Not ADJ)	DD
	BOOT	Remarks	ROM
STB-CAS			

Generally the PCT _ADJ for the color, Backlighting, and Tint is all that is generally required.

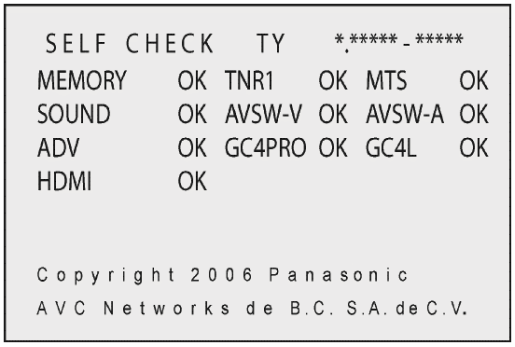
How to Access the Self-check Screen

Access

1. Place the unit in TV mode.
2. While pressing the **VOLUME DOWN** button on the main unit, press the **SLEEP** button on the remote controller unit simultaneously.

Exit

1. Press one of the channel selection buttons to return to the normal screen.



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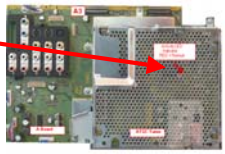
To get into the Self-check mode, press and hold down the **VOLUME DOWN** button on the front of the unit, and the **SLEEP** button on the remote control. Hold the buttons down for at least three seconds. The unit self tunes to channel 3. The word “SELF-CHECK“, followed by a graphic OSD appears at the center of the screen.

All Customer settings (parameters) will be erased. Access the self-check screen to reset the unit. This brings the unit back to factory default.

If the Communication Control port of an IC is addressed and a response is not received by the system control IC, then " - - " or “NG” will appear in place of " OK ".

No Video From Tuner



Check and see if the Tuner Activity indicator is on RED. It is visible through the holes on the cover plate.

Is the Tuner Activity indicator on?

Yes

Replace Tuner

No

Check for the BT 30V, SUB 9V, &, SUB5V voltages on connector AP3 of the AP board. Refer to the AP Board test point locations on Slide 13.

Is the BT30V OK ?

No

Check the cathodes of D7601 & D7602 on the AP Board. Cathode of D7601 should measure 30V. Replace defective component.

Yes

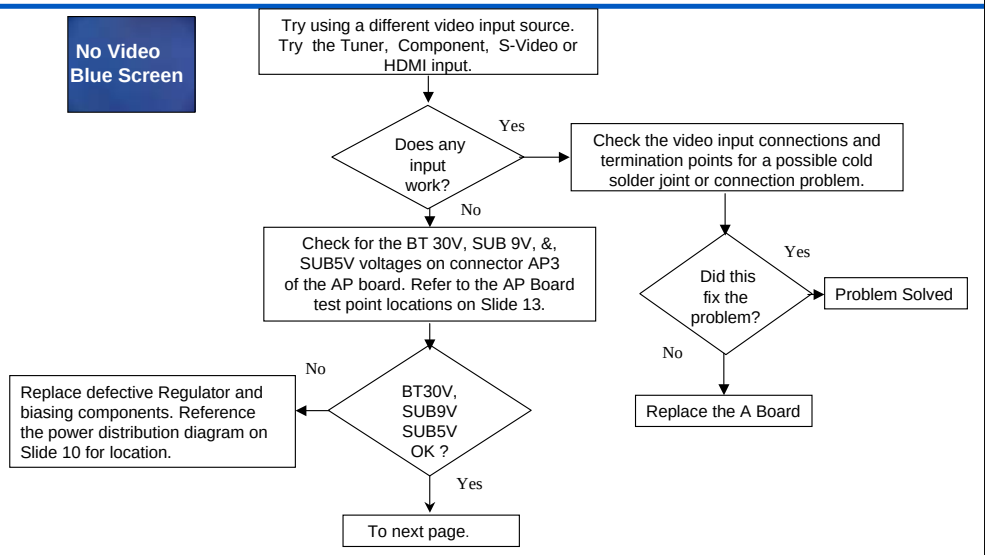
Are SUB 9V SUB 5V OK ?

Yes

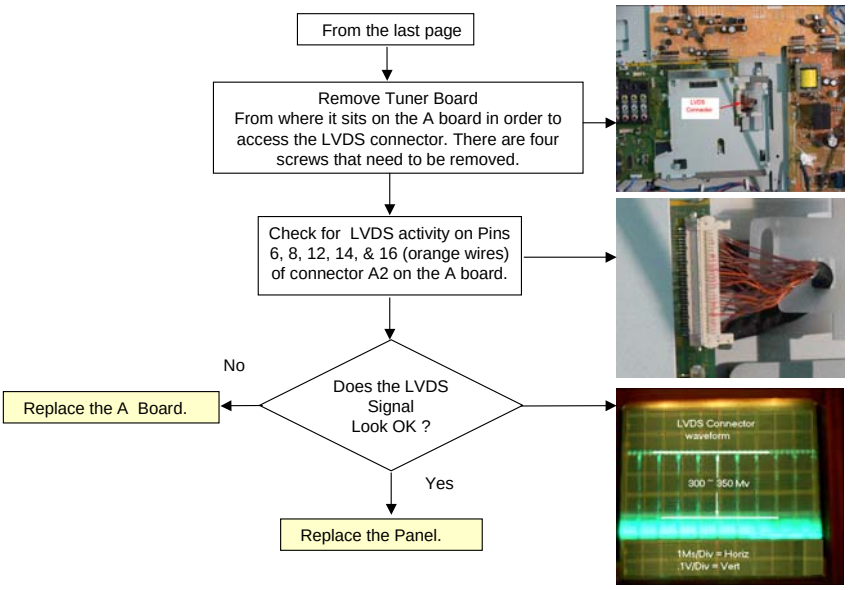
No

Replace defective Regulator and biasing components. Reference the power distribution diagram on Slide 10 for location.

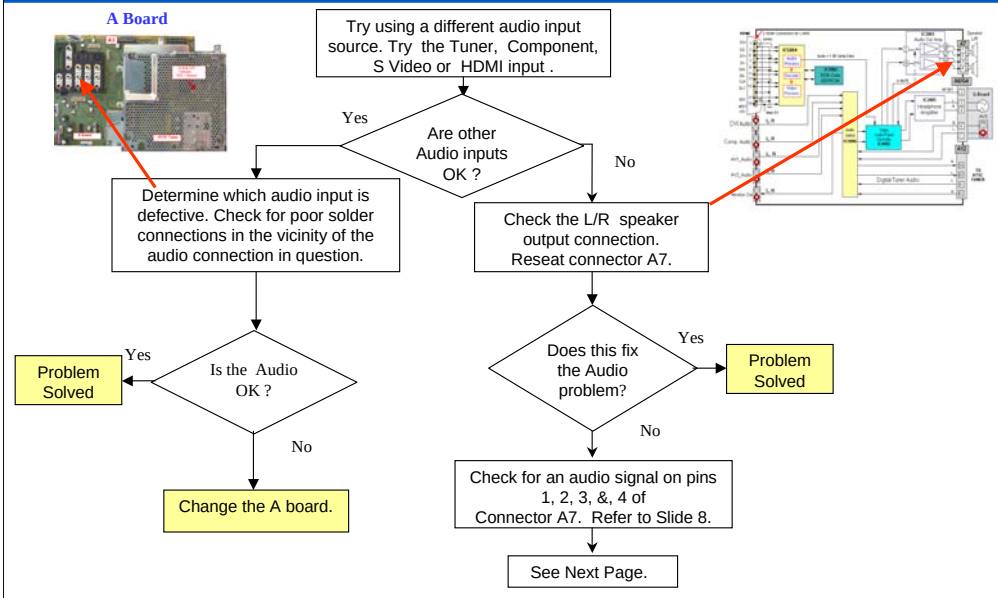
No Video, Dark Blue Screen



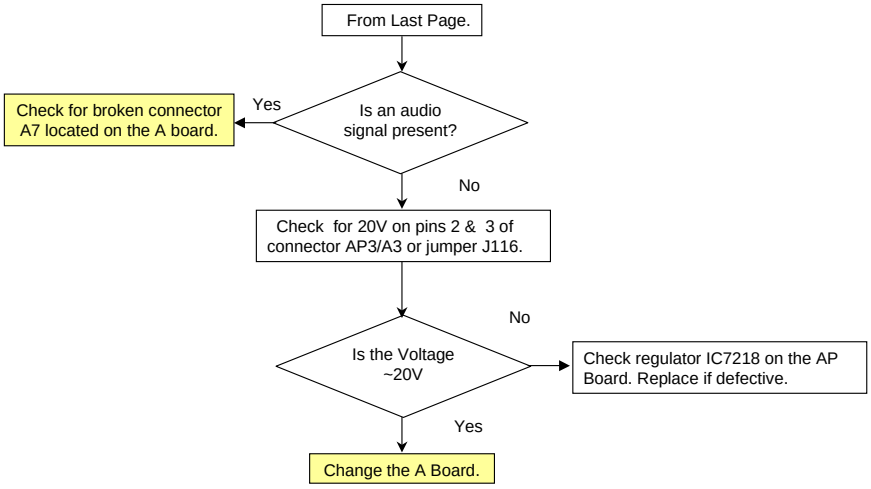
No Video, Dark Blue Screen (Continued)



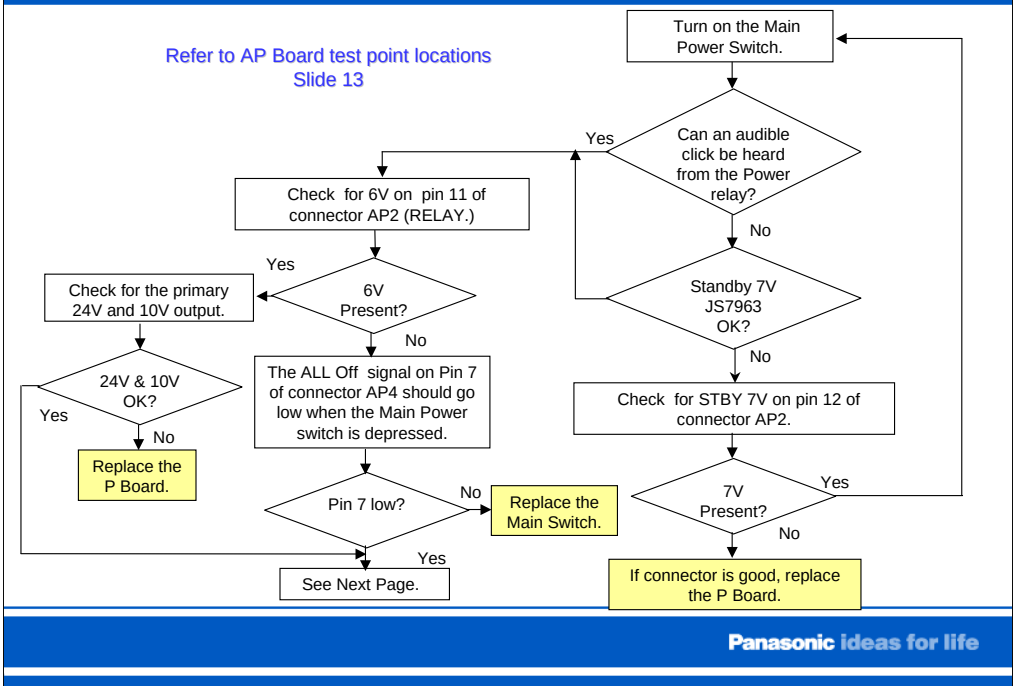
No Audio


A Board
Try using a different audio input source. Try the Tuner, Component, S Video or HDMI input .
Are other Audio inputs OK ?
Yes
No
Determine which audio input is defective. Check for poor solder connections in the vicinity of the audio connection in question.
Check the L/R speaker output connection. Reseat connector A7.
Is the Audio OK ?
Yes
No
Problem Solved
Change the A board.
Does this fix the Audio problem?
Yes
No
Problem Solved
Check for an audio signal on pins 1, 2, 3, &, 4 of Connector A7. Refer to Slide 8.
See Next Page.

No Audio


From Last Page.
Is an audio signal present?
Yes
Check for broken connector A7 located on the A board.
No
Check for 20V on pins 2 & 3 of connector AP3/A3 or jumper J116.
Is the Voltage ~20V
No
Check regulator IC7218 on the AP Board. Replace if defective.
Yes
Change the A Board.

No Power


Refer to AP Board test point locations
Slide 13
Turn on the Main Power Switch.
Can an audible click be heard from the Power relay?
Yes
No
Standby 7V JS7963 OK?
No
Check for STBY 7V on pin 12 of connector AP2.
7V Present?
Yes
No
If connector is good, replace the P Board.
Check for 6V on pin 11 of connector AP2 (RELAY.)
6V Present?
Yes
No
Check for the primary 24V and 10V output.
24V & 10V OK?
Yes
No
Replace the P Board.
The ALL Off signal on Pin 7 of connector AP4 should go low when the Main Power switch is depressed.
Pin 7 low?
No
Replace the Main Switch.
Yes
See Next Page.
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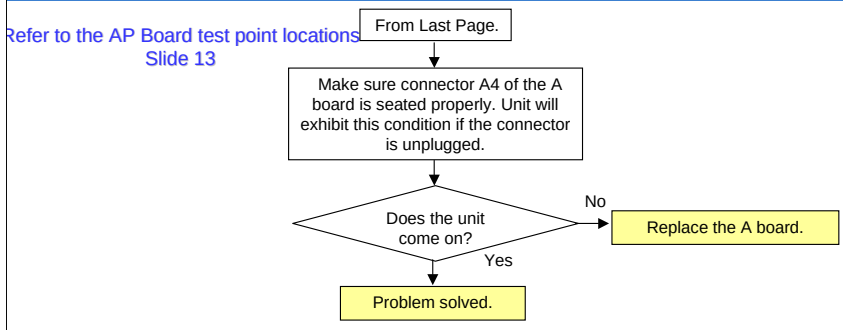
No Power

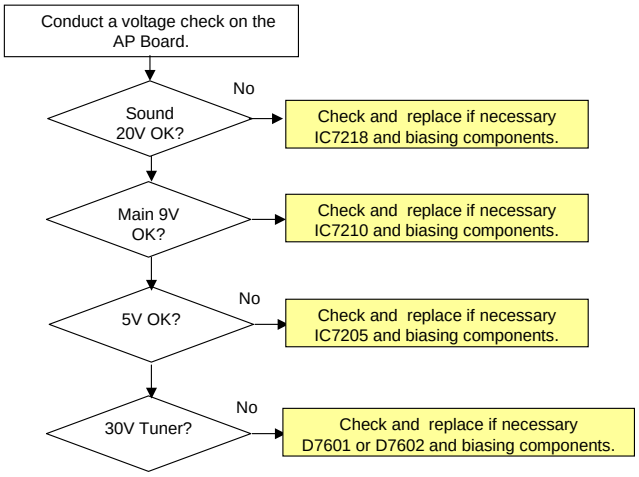

Refer to the AP Board test point locations
Slide 13
From Last Page.
Make sure connector A4 of the A board is seated properly. Unit will exhibit this condition if the connector is unplugged.
Does the unit come on?
No
Replace the A board.
Yes
Problem solved.

Power LED Flashes

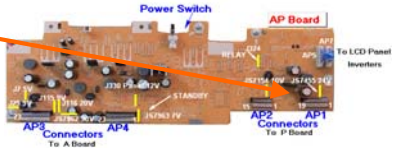
NUMBER OF POWER LED FLASHES	POSSIBLE CIRCUIT (MICRO PIN)	SUSPECTED BOARD
2	INVERTER SOS, NO BACKLIGHT DETECTION (FPGA pin 6)	P, Panel
5	24V down VCTP (pin 106)	A, P
6	9V down VCTP (pin 1)	AP
7	SOURCE VOLTAGE ABNORMALITY VCTP (pin 105)	AP, A
8	FPGA ABNORMALITY VCTP (pin 105)	A

LED Blinks Seven Times

Refer to the AP Board test point locations
Slide 13



LED Blinks Twice Every 5 Seconds



Check for 24V on jumper JS7455 or on connector AP5 pins 1-8.

24V OK?

Yes

No

Confirm that the Inverter_SOS signal on pin 2 of connector A5 is Active High prior to changing the LCD Panel. Use a Peak Hold Voltmeter for measurement.

Unplug connector AP5 and measure for 24V on jumper JS7455 or on connector AP5 pins 1-8.

24V OK?

No

Change the P-board.

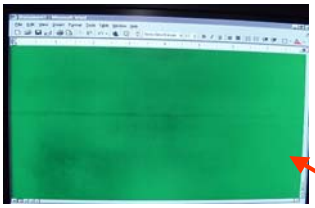
END

Refer to AP Board test point locations
Slide 13

Examples of Defective Panels

Distorted Partial Picture

Horizontal Lines



Green, Red, or Blue Shading

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Pedestal Removal

Affected Models: TC-26LX60/C, TC-32LX60/C, TC-26LX600, TC-32LX600, TC-26LE60, TC-32LE60.

Affected Serial Numbers: **61720001 ~ **61989999

Symptoms: Screws holding the pedestal base to the LCD unit are inverted and base cannot be removed by customer.

Instructions:

Step 1: unscrew the base cover screws (2).

Step 2: remove screws from back cover (14 for 26" models and 16 for 32" models).

Reasons: gap appeared between escutcheon and LCD panel, so screws were inverted to remove gap but pedestal stand removal was not possible any more.

Pedestal Removal

Affected Models: TC-26LX60/C, TC-32LX60/C, TC-26LX600, TC-32LX600, TC-26LE60, TC-32LE60.

Affected Serial Numbers: **61720001 – **61989999

Symptoms: Screws holding the pedestal base to the LCD unit are inverted and base cannot be removed by customer.

Instructions:

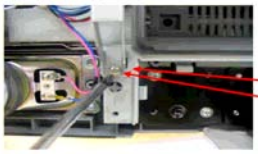
Step 3: Unscrew pedestal screws and reposition as illustrated in the second picture.

NG

OK

Step 4: check bottom of escutcheon and LCD panel for gap, if gap of more than 1mm is present do the following:

1. Loosen the two screws shown in the picture.
2. Push the unit forward a little from the top side.
3. While pushing the unit tighten the screws.



Step 5: Re-attach back cover and pedestal cover following reverse procedure from removal.

The End

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